

INTERNATIONAL SCIENTIFIC COTERIE: VENOUS FUNCTION AND MULTIPLE SCLEROSIS

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CHRONIC CEREBROSPINAL VENOUS INSUFFICIENCY IN MS (CVIMS) MRI VS. DOPPLER CORRELATES

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Objective: Zamboni et al previously reported unexpectedly robust associations between anomalous venous outflow patterns from the principal extracranial cerebral veins and multiple sclerosis (MS) (Zamboni et al, JNNP, 2009). The presence of such vascular hemodynamic (VH) anomalies can cause chronic cerebrospinal venous insufficiency (CCSVI). The aims of this study were to investigate the relationship between the VH changes and MRI measures of MS disease severity.



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Design: Cross sectional survey.

Setting: International collaboration between Italian (Ferrara and Bologna Universities) and US (Jacobs Neurological Institute, SUNY UB) Universities. MRI and clinical evaluation performed at Buffalo Neuroimaging Analysis Center, at The Jacobs Neurological Institute, Buffalo NY, USA

Patients: Sixteen consecutive relapsing-remitting MS patients, (mean age: $36.1 \pm$ SD 7.3 years, disease duration: $7.5 \pm$ 1.9 years and median EDSS: 2.5) were compared to a group of 8 healthy controls (HC) with similar age and sex distributions.

Main Outcome Measures: The number of anomalous VH criteria present were measured using an echo-color Doppler, whereas CSF flow, atrophy and lesion measures were obtained from quantitative MRI analysis.

Results: All 16 MS patients investigated and none of the HCs met the VH criteria for CCSVI ($p < 0.0001$). MS patients showed significantly lower net CSF flow compared to the HC ($p = 0.038$) that was associated with the number of anomalous VH criteria present ($r = 0.79$, $p < 0.001$). Moreover, increases in the number of anomalous VH criteria present were negatively associated with lower whole brain volume (Spearman $R = -0.5$, $p = 0.05$).

Conclusion: VH changes occur more frequently in MS patients than controls. Altered VH is associated with abnormal CSF flow dynamics and decreased brain volume suggesting a common pathophysiological substrate between venous hemodynamic abnormalities and the MS brain pathology as measured by MRI.

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